

#4

Inaugural Dissertation

on

Tetanus

Chs. T. Mattack

admitted March 9. 1820

James M. McKee

Esq.

Chas. T. McKee

admitted March 9. 1821

Tetanus may be defined an involuntary and almost constant contraction of all or many of the muscles, while the senses remain perfect and entire. It is divided into two species, the symptomatic and idiopathic, the former being induced by wounds or other lesions of the solids, the latter by exposure to cold and other disordered causes. By medical and practical writers Tetanic complaints have been distinguished into *Ophithismus*, *Empyriasmus* and *Tetanus*, but as only marking different grades of the same disease, little need be said of these distinctions.

Rarely is there an affection that assails the human system in which the pathology has been more unsuccessfully attempted than in Tetanus. Thus baffled at the outset, practitioners have hitherto directed their attention almost exclusively to an individual symptom, namely, the spasmodic contractions. Hence the inordinate use of opium, ether, the warm bath and every remedy calculated to repress action in the living fibre. The inability of these remedies alone, we would think, should induce practitioners no longer to repose confidence in their efficacy.

Considering almost the whole of the muscular structure is involved in Tetanus, we are almost instinctively led to refer its seat to the source of motion powers. It will be shown in the course of the following dissertation, that the morbid appearances presenting themselves in Tetanus, in those subjects who have been examined after death, tend to substantiate this conclusion.

(2)

Within a very few years, we have been presented with an essay on this disease by Robert Reid M.D. He classes it with diseases incidental to the spinal system. Before entering into its investigation he lays before us a general view of the principles upon which the classification itself is founded. I conceive it unnecessary to enter into the details of this author, though I have perused them with interest and instruction. It will be sufficient that I give the general outlines of his classification endeavouring to make the subject as compendious as the nature will admit.

Upon inspecting the anatomical structure of man, we observe the nerves distributed into three grand natural divisions. The first supplying the organic viscera of the Thorax and abdomen, which from its peculiar formation is properly called the Ganglionic System by anatomists.

The second is enclosed in the bony canal of the vertebral column, and may hence be denominated the spinal system. This distributes its nerves to all the muscular parts of the body.

The third having its centre in the head comes under the name of the cerebral system; to this belong the intellectual powers and the five senses.

Dr. Reid appeals to comparative Anatomy to show that nature seems to adopt this division throughout the various individuals of animated being: some are endowed with the first; others have the second superadded; but man possesses

the three in the highest perfection. Led by these and other considerations which the author has mentioned, while investigating the phenomena of disease, it is obvious that we ought to follow the path which nature points out. He therefore proposes to name diseases under three general heads, which should be named according to the nervous system in which each was principally seated. Alluding to the analogy which at first view might seem to exist between this distinction of the functions and that of the Vital, Animal and Natural functions, he shows the objections to the latter arrangement and then points out the difference between it, and the one proposed.

In favour of a classification of diseases, according to the principles before stated, we obtain a clearer view of the balance of activity, which is necessary to constitute health. This view may be confined to definite limits, when we observe, that although the balance may be deranged, in a particular organ only, or even a part of an organ of one system, yet when weighing it with regard to the others, the whole of the diseased system, must be taken into consideration.

When however we contemplate the functions of the different systems which constitute the human frame, we will perceive that each system is formed by nature to perform certain functions in the animal economy. But they are so intimately connected with each other when conspiring to support the animal body as one whole and entire system, that the functions of any one cannot be interrupted, without

(6)

having some influence upon the rest. The effect of this influence then must be, to excite or suppress the actions of the different organs. We will find however in the investigation of disease, that the systems, which are not immediately engaged in the morbid state, will take on actions, which are not only capable of resisting the effect of disease upon themselves, but often prove salutary, by restoring the healthy balance of activity, throughout the whole. This tendency then is the long celebrated *Vita medicatrix Naturae*, which we are enabled to point out with some accuracy, and support or excite, during the treatment of disease, by considering the operations of the animal frame, according to the classification which is now proposed.

If we could discover any property peculiar to a nervous system, which cannot be present when such nervous system is absent, and must therefore be essential to its perfection, it is evident that any disease affecting that nervous system, must be indicated by a modification of that property. Hence then to form any certain diagnosis of disease, we must know what essential property of the nervous system, is primarily and principally affected in each. When we consider that each system of nerves, is distributed to certain parts of the animal frame, and then performs an exclusive function, although the three systems are held in reciprocal communication, by pointing out, clearly, the functions which each has to perform, in the healthy state, we will find little difficulty in appropriating a disarrangement of any part of those functions, to its proper class.

The Ganglionic system is appropriated by nature, to the formation of the various substances, which compose the animal body, and to remove those particles which have already performed their office. Any disease, therefore, primarily affecting these functions, must belong to the ganglionic function system. Physiology teaches us that the nerves originating in the spinal canal, are all devoted to the muscular parts of the body. And that every part constituted of muscular substance, must derive its stimulus of activity from this system. In viewing the connection, however, between this system and the Ganglionic, we observe a very important circumstance. It has already been shown that the latter is calculated for the formation of the different materials of the animal frame, but when the spinal system is superadded, this appears to regulate entirely, the mode in which these substances are to be deposited.

Thus we find that when a spinal nerve is divided, or included in a ligature, the parts to which it was distributed, first cease to grow, and then diminish in size, owing to absorption continuing after the deposition of new particles had been stopped. These phenomena occur although the sanguiferous circulation be unimpaired. Paralysis is a familiar example of this circumstance from disease. Another important circumstance, is, that no heat will be generated by the circulation of blood through the part. This is proved by the experiments of Mr. Brodie, as related in the Philosophical transactions of the Royal Society of London, having destroyed the functions of the nerves by means of certain poisons, while the circulation of the blood

was unimpaired, the temperature of the animals gradually diminished.

If then we should observe that the action of the muscles was impaired, while the circulation of the blood continued free, or that the muscular substance became diminished, while the power of assimilation remained perfect, we should have little hesitation, in attributing the disease to the spinal system.

With respect to diseases of the cerebral system, it is obvious, from what has been said of the others, that any affection of the intellectual powers, and of the five senses must belong to this, as we find that the nervous mass of the brain, is appropriated to these functions. As, however, in man and the superior animals, the substances necessary for the nourishment of the individual, must be chosen from the great variety of materials, which surround him, some of which are highly destructive to the powers of life, we see there must be an intimate connection between this system, which is endowed by nature with the capability of making a choice, and the other systems. This must therefore regulate the others. But as it must be supplied itself, with energy, by the ganglionic system, we may perceive how intimate a connection between these two must always exist. Hence disarrangements in the functions of the latter, so frequently excite diseases in the former, & vice versa. There is, however, a very material advantage derived from this circumstance, in the treatment of diseases of the cerebral system, as we are enabled to relieve diseases of that class, by acting with medicines on the Ganglionic system.

The first of these is the fact that the
 world is not a uniform whole, but is
 made up of many different parts, each
 of which has its own peculiar character
 and its own peculiar history. The second
 fact is that the world is not a static
 whole, but is constantly changing and
 developing. The third fact is that the
 world is not a simple whole, but is
 a complex whole, made up of many
 different parts, each of which has its
 own peculiar character and its own
 peculiar history. The fourth fact is
 that the world is not a uniform whole,
 but is made up of many different parts,
 each of which has its own peculiar
 character and its own peculiar history.
 The fifth fact is that the world is not
 a static whole, but is constantly changing
 and developing. The sixth fact is that
 the world is not a simple whole, but is
 a complex whole, made up of many
 different parts, each of which has its
 own peculiar character and its own
 peculiar history. The seventh fact is
 that the world is not a uniform whole,
 but is made up of many different parts,
 each of which has its own peculiar
 character and its own peculiar history.
 The eighth fact is that the world is not
 a static whole, but is constantly changing
 and developing. The ninth fact is that
 the world is not a simple whole, but is
 a complex whole, made up of many
 different parts, each of which has its
 own peculiar character and its own
 peculiar history. The tenth fact is that
 the world is not a uniform whole, but
 is made up of many different parts,
 each of which has its own peculiar
 character and its own peculiar history.

Having given the outlines of Dr. Reid's arrangement, its utility may readily be inferred. It unquestionably unites many advantages in the present imperfect state of physiological science. Nervous influence is distributed by him into three kinds, and this division is recognized in the leading functions of the animal economy. To one is allotted the control over the organic viscera of the thorax and abdomen, to another the stimulus of muscular action, and to the last is appropriated the five senses and the intellectual powers. Under medical influence the animal economy sometimes confirms this distribution division in the most singular manner — But so dependent are the different functions on each other, it should steadily be kept in view that they are indissolubly united for the support and regulation of the animal economy. Each participates in the morbid affections of the other. "When one is morbidly affected the others take on actions which are not only capable of resisting disease on themselves, but often prove salutary, by restoring the healthy balance of activity, throughout the whole. There are it is true exceptions to this law, depending chiefly on the nature of the disease. Thus, it is the nature of Malignant Typhus fever to depress the vital energies at once, every function therefore participates in the stroke, and a tendency to dissolution is the consequence. "In Tetanus" says Dr. Rush "the efforts of nature appear idle."

There are phenomena, which present themselves in Tetanus, worthy of remark. Some muscular parts resist the effects of the disease for some time, and fall into the general destruction only, towards the fatal period. These muscles may be divided into two classes, the one comprehends all the muscular parts of the thorax and abdominal viscera, and the other all those which belong to the organs of any of the five senses.

Thus it is observed that the Laryngeal functions are little affected, vomiting sometimes occurs, but generally does not continue. It is usual enough for the appetite of hunger to remain, through the whole course of the disease, and what food happens to be taken, seems to be regularly digested; the urine is regularly secreted, although sometimes retained, and is voided with difficulty and pain. When the spasms are violent, the pulse is contracted, hurried and irregular; but the respiration is affected in like manner, and during the remission, the pulse and respiration usually return to their natural state.

With respect to the second class, we observe that the tongue retains its mobility for a considerable time, the arms also do not become affected, till long after the lower extremities, and even when the muscles belonging to them are affected with spasms, those alone escape which move the fingers, and these often retain their mobility to the last. The head also in this disease is seldom affected with delirium or even confusion of thought;

till the last stages of it, when by the repeated shocks of a violent distemper, every function of the system is greatly disordered.

By reflecting on these phenomena of the disease, we are led to observe that the thoracic and abdominal viscera, are not primarily affected.

There are circumstances which show, that the cerebral system especially has rather a tendency to oppose the disease, than to participate in its effects: thus, we observe that the tongue, which is the principle organ of taste retains its power of free motion, until the cerebral system becomes affected. Now we know that the gustatory nerve, is a branch of the 5th pair, which properly belongs to the cerebral system, while the ninth pair are acknowledged to be those which supply the muscular parts of that organ; and are found to arise from the inferior part of the Cerebrum pyramidalis to go out of the skull by their proper foras in the occipital bone. We also observe, that the principle organs of touch, are in the hands, which in man are placed in the upper extremities. The nerves of touch should then, in this situation, oppose the effects of the disease. This we find to be the case, as I observed before, that the upper extremities remained a long time exempt from spasm, and that the fingers are often continued so to the end. The opposition of the cerebral to the action of the spinal system in Tetanus is very plainly shown at the commencement of the disease, when in a mild state. For then the spasms are most frequent, immediately on the patient inclining to sleep.

(18)

This is often so obvious to the patient himself, that the dread of the recurrence of spasm, is sufficient to keep him in a constant state of anxiety and watchfulness.

Having thus explained how these two systems do not appear to be the seat of the disease, we must naturally conclude that it rests altogether in the other system, or that of the spinal canal. Every circumstance of the disease conspires to substantiate this idea. We observe that the only parts of the body which are engaged in the disease, from the commencement, are those constituted of muscles; but upon dissection there is not the slightest injury to be discovered in their structure. Now we know that the nerves, which are distributed to these parts, and are the proper stimulants to muscular action, in the living body, all take their origin from the nervous system of the spine. It is natural to conclude that as we cannot discover on examination after death any morbid change in the parts which are acted on by the disease, we should expect to meet with some change in the parts which afford the stimulus to muscular action; hence the disease must be seated in the nervous system of the spine.

I shall first give a detail of the dissections in his own words, made by Dr Reid, and then hazard ^{a few} remarks on some of the morbid phenomena observed.

Morbid Appearances

In the first two patients, which I had an opportunity of examining, the disease did not prove fatal, until the fourth day. No morbid appearances could be

discovered in the viscera of the thorax or abdomen. The only appearance of disease that could be discovered in the brain, was some increased vascularity, particularly in the membranes, but there was a considerable quantity of water flowed from the spinal canal, after the brain had been removed.

"On the 25th of February, having occasion to visit, about three miles from town, I was requested to see a boy, aged 13, who the night before, had received a severe burn in the toes of the left foot. I was informed he was a beggar, who went about the country, exposed to the vicissitudes of the weather, during an inclement season, and that the evening before, he went to rest in a lime kiln, where he was found the next morning in the state I saw him. Having no friends, nor habitation, I directed that he should be sent to the Richmond Surgical Hospital, where he remained under treatment for four or five days, when Tetanus came on, with the usual symptoms, and in thirty six hours after the first attack, he expired. I did not however see him again until after he died.

"On examination of the body, after death, the viscera of the abdomen and thorax appeared perfectly natural, and there could not be discovered any morbid appearance in the muscular parts. The brain appeared healthy in every respect, except some increased vascularity in the investing membranes. Upon opening however, the cavity of the spine, from the back part there appeared to be a fatty substance* deposited in the cellular tissue, investing the dura mater, for the

* Since writing the above I find that this fatty substance is natural to the part. It was taken notice of in the examination of this case, on account of its being absent at both parts of the column, exactly opposite to where the inflammation was after it was formed, on raising the mass from the vertebrae.

extent of several of the dorsal vertebrae. On raising the nervous mass (with its dura mater entire) from the spine, there appeared a considerable effusion of blood into the cellular tissue, connecting it to the upper lumbar and lower dorsal vertebrae. A similar effusion occurred also along the bodies of the upper dorsal, and two inferior cervical vertebrae. On flitting up the dura mater, on its anterior surface, or that next the bodies of the vertebrae, the nervous mass appeared highly vascular, and the vessels of every description, remarkably tortuous. In the part which was situated opposite to the sixth and seventh dorsal vertebrae, there appeared a whitish substance very nearly resembling the medullary matter effused between the arachnoid coat and pia mater, occupying the space of about an inch and an half, and covering about half the circumference of the nervous mass. On breaking the membrane enclosing it I could wipe it off, and then could not be the slightest rupture discovered in the pia mater, or any of its vessels. The only appearance in the nervous substance itself, that I could discover, was a deeper tinge than natural, in its cortical and medullary matter.

The remarkably circumscribed appearances of both the extravasations of blood, which have just been described, and which ~~encompassed~~ ^{surrounded} the accompanying ~~spinal~~ ^{nerve} would at first lead one to imagine, that these were the result of local injury. We find, however, a very satisfactory proof, that a general affection, such as this, may be capable of causing such local effects, in the accounts lately published by Dr. Worsfield of the effects of some Indian poisons. (Read.)

(24.)

Without detailing the experiments of Dr. Wasefield, I shall attempt to show why the morbid appearances observed in the medulla spinalis of this beggar, appeared where they did.

The appearance of extravasated blood in the cellular tissue connecting the nervous mass to the upper lumbar and lower dorsal vertebrae, and a similar appearance along the bodies of the upper dorsal and two inferior cervical vertebrae, may reasonably be accounted for in this way. The part of the spine now usually affected in great bodily fatigue, or any undue action of the muscles, is about the union of the dorsal and lumbar vertebrae, or the small of the back as it is called - this is proved from the experience of any one who is at all conversant with that degree of fatigue which is attended with a feeling of languor. We need not wonder why this should occur. The spine being covered and susceptible of slight motion at the place under consideration, the weight of the body above the weakened part exerts almost all its force at this spot. The consequence is, that the spinal marrow is more subjected to injury at this part under the violence of tetanic action. Nearly the same may be said of the union between the last cervical and first dorsal vertebrae, which conjointly may be said to form a lever of the third kind. The upper dorsal vertebrae being the fulcrum, the head the resistance, and the muscles of flexion or extension the power applied. Force and pressure

is therefore concentrated in this case principally on the first dorsal vertebrae.

Even in tetanus especially of the opisthotonos kind, the operation of force may easily be conceived to be very powerful.

It must be left to future observations, however, to determine whether the morbid appearances in Tetanus ^{populi} more commonly occur at the places mentioned.

I regret that dissections of the spinal marrow of those destroyed by Tetanus are not more numerous. Dr. Reid gives us a passage from Removius, which proves that morbid appearances have been observed in the nervous system of the spine, by several who examined that part, in those who died of Tetanus.

From the morbid appearances just enumerated, it seems evident, that the disease is of an inflammatory nature. It would also appear, that its principal seat is in the membranes, investing the nervous mass of the spine; for we can observe here, the peculiar characteristic of membranous inflammation in the remarkably tortuous state of the vessels of the part.

"It is a remarkable circumstance in the effects of the disease, that when it has not been so violent, as to destroy the patient, before the third day, a watery or other fluid will be thrown out in the spinal canal. And this may always be expected to occur when the disease has been of long continuance."

of very curious circumstance is, that we can produce this disease, by artificial means; for when an animal has been decapitated, if we instantly introduce a slender wire down the spine, so as to irritate that nervous system, without compressing it completely, the muscles of the animal, are immediately thrown into that state, which is peculiar to tetanus.

I have myself excited preternatural contractions in the muscles of a cat by cutting down to the spinal marrow and exciting its energy with some irritating body.

(Causes of Tetanus)

"The causes of Tetanus, may be divided into those which give a predisposition to the disease, and those which immediately excite it.

"The exposure of the body to the vicissitudes of the weather, appears to be the most general predisposing cause of the disease. Thus we observe that in the army, it is prevalent during the campaign, when the men have been exposed to the vicissitudes of the season. It is however, a remarkable circumstance, that this dreadful malady is very seldom met with, even in its slightest stages, among the navy, while it is found generally fatal to military men. It may appear strange, that the vicissitudes of the weather, should be esteemed a predisposing cause, while we observe that Tetanus is so very rare a disease, among seamen, who are continually exposed to its influence. But when we reflect upon the nature and habits of the two professions, we may in

some degree develops this mystery. In the sea service the men, although exposed to changes of wet and cold, yet on account of the regularity which is observed in the naval service, the constitution of the individuals, become habituated to the changes of the atmosphere. On the contrary the soldiers, while in barracks, are completely defended from the severity of the seasons; but on entering the scenes of action, they become exposed to all the various changes of the weather. This is particularly hurtful to them, during the dampness of the night, when they are often obliged to sleep in the open air.

"It may be useful to take notice here of another circumstance, which gives a predisposition ⁱⁿ soldiers, to this disease, and to which sailors are not exposed. We observe that soldiers are, unavoidably, obliged to carry a certain portion of their luggage, in their knapsacks on their backs. Now we know that in an active campaign, it is impossible for nature, to adapt itself to the various changes, which must occur in the temperature of the parts, on the vicinity of the spine, by wearing the knapsacks or not, at such uncertain periods. Indeed circumstances analogous to this would seem to account for horses being more liable to this disease, than any other quadruped.

There is one important remark made by the venerable Rush, which I cannot pass over. "All the remote and exciting causes" says he "act with more or less certainty in proportion to the fatigue which has preceded them."

Now we know that the consequence of muscular fatigue is a propensity in the system to apoplexy. The muscles of voluntary motion perform their office with reluctance and languor, showing that the nervous stimulus which they receive from the spine is deficient, and requires restoration from the influence of balmy sleep. When this expenditure of its native energy the spinal marrow must be weakened, and every pathologist is acquainted with the disposition of weakened parts to assume inflammation. Now I to hazard an opinion, I should say, therefore, that the spinal marrow takes on inflammation in consequence of its weakened power.

"These are cases on record, where the disease came on by mere exposure of the body to a cold breeze, while over heated and fatigued by exercise.

But it is evident such circumstances may, and have frequently occurred, without the disease having been induced.

All ages, temperaments and complexions, are liable to Tetanus; but the male sex is more frequently attacked with it than the female; and those of a robust and vigorous constitution, more frequently than those of a weak habit. — The exciting causes of Tetanus, are extremely various.

But it most generally happens in consequence of wounds. It is often surprising, how slight the wound may be, which will be capable of producing the disease. "Several burns on the extremities, when the substance of the part has been destroyed, are very generally attended with this disease.

A slight splinter under the nail, has been known to excite Tetanus.

It is Dr Reid's opinion that true Tetanus never arises from injuries or derangement of internal organs. He has been sensible as yet, to find any case, records of true Tetanus, which arose from internal injury whether in the alimentary canal, or elsewhere. To distinguish Tetanus, therefore, from the tetanus arising from derangement of the alimentary canal he gives its diagnosis. This appears to me hardly necessary, as its symptoms when completely formed are so unlike those in other spasmodic affections, it may easily be distinguished. — But ~~are~~ those spasmodic contractions in the jaw which arise from causes in the alimentary canal, different in kind from the contractions arising from the acknowledged causes of Tetanus? I should think differently, and I found my conclusions on the simple fact that Tetanus is sometimes induced by taking huckleberries and the datura stramonium into the stomach*. I shall have occasion to speak of this when considering the treatment of Tetanus.

Prognosis.

"Tetanus has been observed in general, to be more fatal when arising from a wound, than from any other cause. It is even possible often to foretell the approach of Tetanus, by the state of the wounded part. Thus we observe that when the disease is forming, the wounded part appears destitute

* Dr Rush, Medical Inquiries

of that inflammation which is necessary to support the healing process. This recurrence happens with inflammations, situated in any part of the body: tumours will often diminish or disappear altogether previous to the appearance of the disease."

Do not the above facts seem to show that there is a metastasis of inflammation to the spinal marrow?

When the spasmodic contractions quickly succeed each other, and are excited by a very slight cause, it is obvious that the disease is even dangerous, than when there is a considerable interval.

It has always been observed, that the inflammatory appearances of the wound, when that has been the exciting cause of the disease, have considerably diminished, previously to its development. This has been so frequently remarked, that some authors recommend, as a means of assisting in the cure of the general disease, to bring back the inflammation to the wound.

(Treatment)

Whatever may be our views of this disease, it is obvious our practice will be regulated accordingly. So long as practitioners were undecided as to its seat, they were justifiable in resorting to those remedies which were calculated directly to subdue spasm by repressing the powers of the system, but finding the usual means so often disappointed their hopes

many innovations were introduced into the treatment of Tetanus. Almost every mode of treatment, however, which has hitherto been dictated, when contrasted with that which a more correct pathology offers us, must sink highly in our estimation.

Dr Reid considers that the Trismus which occurs from an internal irritation should not be classed even as a lesser grade of true Tetanus, but the distinction which he offers, I consider unimportant and futile. Indeed he speaks of Trismus nascentium as if always confined to the jaw alone. Although its etymology may thus limit the affection, practical writers tell us, that it not only affects the jaw which is rigid and closed, but in some cases it extends to the neck or trunk which is stiff and bent back. "This disease" says Dr Reid "is cured by purgatives alone": yet it is decidedly very fatal. The opinion is weakened at once by the fact that certain poisonous substances when taken into the stomach in certain quantities, will induce Tetanus as I have before mentioned.

Considering the morbid appearances of Tetanus, they would seem to indicate blood letting and in some instances the practice has been without doubt beneficial. Above it resorted to, however, preference should be given to its local employment and those places should be selected for

(40.)

Y

the purpose when I have endeavored to show effusion and injury is more likely to happen. These places are in the vicinity of the lower dorsal and first lumbar vertebrae & of the lower cervical and first dorsal. Dr. Reid recommends blood letting in no shape. "By general bleeding" says he "the sanguiferous system of the brain, is principally affected; by which means the energy of that organ may be diminished even so far as to induce syncope. Besides as it has been shown, the nervous system of the brain seems to resist the disease, by abstracting blood it is evident we weaken one of the most powerful antagonists to the morbid action; and thus diminish our power of assisting the general destruction. However just his reasons may be against general blood letting I am sure they cannot extend to its local employment when properly conducted.

When Tetanus is occasioned by a wound, it has been the practice to endeavour to bring back inflammation to the part by stimulating applications, such as the lunar caustic, oil of turpentine &c. A case of Tetanus which was successfully treated by Dr. Stephenson of Baltimore in this manner is recorded in the 3rd. No. of the medical and Physical Journal p. 120.

"As the disease is seated in the spinal canal; it is obvious that external inflammation, would have effect, in proportion to its vicinity to the seat

of the disease, we may be led to expect some advantage from a blister along the spine. This has been tried with success, in a case related by Dr. Carter in the medical transactions. He however assisted its efficacy, by employing, at the same time some powerful cathartics.

We have further evidence of the efficacy of exciting external inflammation near the Spinal Canal in Pott's disease. Dr. Haasthorpe of this city has effected cures of the disease, by the use of the caustic alkali applied over the cervical vertebrae. The remedy was first used by him in 1814. Since that period it has been resorted to by others, who have every reason to be satisfied with the results of its application.

In conjunction to blisters, with the view of promoting the absorption of effused fluid in the spinal canal - benefit may be expected from the use of mercury.

"When speaking of the distinction, between the function of the Sympathetic and spinal systems, it was observed that the latter, influenced the disposition of new matter, throughout the body. It is evident, therefore, that in a deranged state of this system, the functions of the ganglionic must be considerably impeded by accumulation in its different viscera. Hence, various unnatural substances are thrown into, or formed, in the alimentary canal. We must, therefore, perceive the necessity of employing

purgative medicines during the course of this disease. Indeed, so great derangement has been often observed in the Splanchnic viscera, after this disease, that many have been led to think, that Tetanus arises entirely from the morbid state of some of these organs. Thus Mr. Abernethy advises, that the seat of the disease should be looked for in the stomach. It is obvious, therefore, that we should pay considerable attention, to the state of this system, in the treatment of tetanus.

I might add to the names of Mr. Abernethy, that of Dr. Hamilton, who by the use of purgatives alone cured the disease. In conjunction with Mr. Abernethy, Dr. Hamilton referred the seat of this disease to the stomach. The alvine excretions they observed were unnatural in colour, which induced them to refer the cause to the important organ above mentioned.

The painful sensation under the cartilaginous occupying the region of the stomach seems to have ^{partly} induced Dr. Hamilton to refer the seat of tetanus to this viscus. As this symptom requires palliation, it may not be improper to mention the use of a mixture of laudanum and castor as an embrocation to the part. Dr. Ferrié of Liverpool found it afforded great relief in his cases. Warm flannels should be placed on the part, held down with the hand to prevent evaporation of the ether.

With respect to the choice of purgatives, I should have mentioned, they must be of the most active kind. For this purpose calomel and jalap, or calomel alone answers a good purpose. Should any particular viscous have been affected with disease, previously to the attack of Tetanus, we should bear that in mind, when considering what medicines are best adapted to produce the desired effect.

"The employment of the cold bath, has considerable effect upon the disease; it has been extolled by several, as having been attended with the greatest success. In the 6th vol. of the Medical observations and Enquiries, Dr Wright, has published a narrative of the first trials of this method, which were all successful. The way adopted consists, in plunging the patient in cold water, and in that of the sea when at hand in preference to any other; or else, in throwing from a height, several pails full of cold water, over his body; after this has been done he is to be very carefully dried, and put to bed, when he should be only slightly covered with clothes, and take twenty or thirty drops of laudanum. The symptoms usually seem to give way in a certain degree, but the relief which the patient experiences, is not of long duration, and it is necessary to repeat the same measure, at the end of three or four hours. They are to be repeated in this manner, at such intervals, until those of freedom

from the attacks of the disorder increase in length. This desirable event gradually soon follows, and ends in a perfect cure.

We do not, however, find this remedy, attended with such complete success in these climates, and from what has been said of the nature of Tetanus, this remedy, would not appear to have so decided an effect, as caustic applied along the spine. Besides this, it must be attended with considerable torture to the patient, as the slightest movement, will often be sufficient to excite the spasm.

"There are numerous cases on record" says Dr. Reid, "which are said to have been overcome by opium, given in excessive quantities. Indeed it sometimes may have been a very efficacious remedy, but from the same source of knowledge, we also learn, that it has often failed. Even when success has attended, the extensive exhibition of opium, the constitution of the patient, has been materially injured, and the function of the alimentary canal, has continued afterwards for a considerable time very much deranged. When this medicine has been principally relied on, for the cure of Tetanus, it produces this effect, by its sedative power on the general frame. Now, in explaining the nature of this disease, it was shown, that Tetanus is peculiar to one system ~~alone~~ only. We should therefore, rather wish to suppress, than to repress the actions of the others. Hence it would be preferable, to

direct the force of this medicine, against the diseased system, by combining it with other medicines calculated for the purpose, than to allow its action to be general; which must be the case, when it has been exhibited alone."

It is somewhat astonishing that Dr Reid should omit to take notice of the primary effect of opium which is known to be stimulant. I believe it is from this effect alone on the system, that it often proves beneficial in Tetanus. It is well known that more of the article is required to produce a sedative effect in this, than in almost any other affection, to which the system is liable, at this period, therefore, more is required before it unfolds its stimulant effects, and every succeeding day the system requires an increase for the dose before it will respond to the action of the remedy at all. Hence, practitioners may have been deceived in supposing, as they would be likely to do from the quantity given, that a cure was effected by the sedative action of the article. According to the Drs own view of the disease, opium given as a stimulant, should cure it, and no doubt has been instrumental to this effect in many instances. I do not deny, that by its universal sedative influence too, it may cure the disease; thus every system being brought under its sedative action, irritability is almost done away in paralysis. As a stimulant it is not to be selected from the want of durability in its action and the frequency with which it is necessary to repeat the doses.

The curative action of stimulants will be spoken of hereafter.

Dr Reid recommends the use of sudorifics from the following considerations, which may not be entirely satisfactory. Indeed, the view which I take of this salutary action is entirely different.

"When we consider that the muscular power is entirely appears considerably exhausted, after long or violent exertion, and that most generally the effect of such exhaustion is profuse perspiration, we may conclude, that when profuse perspiration occurs in disease, that the powers of the nervous system of the spine must be weakened. This we find to be the fact, as no disease is attended with greater debility, than that accompanied with this symptom in excess. Now as this disease is the extreme of action in this system, which would become paralysis, if the effusion on the membranes involving the nervous mass, were to amount to compression; it is evident our principal object in the treatment of Tetanus, should be directed to weaken its energy. To procure free and copious perspiration, would appear the most efficacious method, of accomplishing this end."

"In the compound powder of *apricacuanha*, we have a preparation, very powerful for this purpose. For by this combination the whole force of the opium, which is supposed so powerful in this disease, is directed to the proper point. "The efficacy of this mode of treatment is abundantly

conspicuous in the excellent relation of some cases of this disease, by
 St Latham."

"With respect to our treatment of the cerebral system, in this complaint, we
 should certainly endeavour to prevent it if possible from being overcome by
 the impending distention. It has been shown in describing the symptoms
 of this ~~terrible~~ terrible disease, that the brain appears for a long time to
 resist its encroachment; we should therefore, support this system, in the due
 performance of its functions, by stimulants proportionate to the necessity of
 the case: not however to urge them by any means so far, as to induce the
 contrary effect."

There would at first view ^{appear} ~~be~~ an obvious impropriety in administering
 Stimulants in this disease considering it as an inflammatory affection; but
 from what has been said we may infer that in proportion as we excite the
 energy of the brain to a certain degree, we repress the action of the spinal
 system in Tetanus. Experience, however, and that alone has shown us, that
 the evil attending this increase of inflammation if it occurs at all, bears no
 comparison with the benefit of exciting the energy of the brain. Nay, the
 action we induce in the one system opposes morbid action in the other.

"Madeca wine, is by far the best stimulant, that can be employed, to
 support the energy of the cerebral system in Tetanus. This may be given

The first of these is the fact that the
 system of the world is not a uniform
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The second is the
 fact that the system is not a static
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The third is the
 fact that the system is not a uniform
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The fourth is the
 fact that the system is not a static
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The fifth is the
 fact that the system is not a uniform
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The sixth is the
 fact that the system is not a static
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The seventh is the
 fact that the system is not a uniform
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The eighth is the
 fact that the system is not a static
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The ninth is the
 fact that the system is not a uniform
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles. The tenth is the
 fact that the system is not a static
 one. It is a system of many parts,
 each of which has its own laws and
 its own principles.

to the patient in small quantities, frequently repeated at short intervals.
But it should on no account be given, so as to produce intoxication.

This however, can only be ascertained, by the effect which it produces on the patient, and cannot be judged of, by the quantity which has been exhibited: for it will often be wonderful how large a quantity of wine or spirits, a patient can take in this disease, before it will have any perceptible effect upon him. The advantage of Wine or spirits as a remedy in Typhus, has been often so conspicuous, that some have imagined the cure of the disease, may be accomplished by it alone.

There are many other remedies which may be of use, in conducting the actions of the different systems; but it would be unnecessary to mention them. Written in the different journals it is true have recommended particular remedies from which benefit is said to have been derived. But experiment in medicine is often attended with danger and unless we are put in possession of the precise circumstances under which a favorite medicine has been exhibited, it would be improper to make use of it: Science is but little benefited from this, or that mode of treatment unless such information is possessed. — The great desideratum in Medical science is correct Pathology — which does more for medicine at once, than the accumulated labours of the devious experimentalist has done for ages.

With it, we have a code of principles in perspicuous language before us: we can resolve the many forms of treatment which have been empirically used, into the deductions of science.

But the treatment of disease will ever demand the exercise of a discriminating judgment, which science indeed may enlighten, but which experience alone can perfect.

When we find the experience of the wise and the circumspect, to differ but little from the deductions of Pathology we are safe; we have at least a test of the soundness of that pathology.

I am indebted it will be observed to the labours of Dr. Reid for a large portion of what has been advanced. I have not gutted my subject however, without attempting some illustrations. His classification of diseases, together with his pathology and treatment of Venues I have adopted. The classification itself cannot give rise to any mischief when applied to practice, but is well calculated to facilitate our researches into disease and to point out the indications to be pursued.

The first of these is the fact that the
 human mind is not a blank slate at birth.
 It is filled with a variety of impressions
 which are the result of the environment
 in which it is placed. These impressions
 are the foundation of all knowledge
 and are the source of all learning.
 The second fact is that the human mind
 is not a passive recipient of impressions.
 It is an active agent which selects
 and interprets the impressions which
 it receives. This process of selection
 and interpretation is the basis of all
 thought and action. The third fact is
 that the human mind is not a static
 entity. It is constantly changing and
 developing. This process of change
 and development is the result of the
 interaction of the mind with the world
 around it. The fourth fact is that the
 human mind is not a single entity.
 It is composed of many different
 parts which work together to form
 the whole. These parts are the
 senses, the memory, the imagination,
 the reason, and the will. Each of
 these parts has its own function and
 its own contribution to make to the
 whole. The fifth fact is that the
 human mind is not a private entity.
 It is a social entity which is shaped
 and influenced by the society in which
 it lives. The sixth fact is that the
 human mind is not a divine entity.
 It is a mortal entity which is subject
 to the same limitations and weaknesses
 as all other mortal beings. The seventh
 fact is that the human mind is not a
 perfect entity. It is an imperfect
 entity which is constantly striving
 for perfection. The eighth fact is that
 the human mind is not a solitary
 entity. It is a social entity which
 is constantly interacting with other
 minds. The ninth fact is that the
 human mind is not a static entity.
 It is a dynamic entity which is
 constantly changing and developing.
 The tenth fact is that the human mind
 is not a single entity. It is a complex
 entity which is composed of many
 different parts which work together
 to form the whole.

1843 Dec 10

to Mr. Huntington

My dear Sir

